

# Practices towards Dust Control in Dental Prosthesis and Appliance Adjustments: A Survey among Dental Students of Western Maharashtra

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## ABSTRACT

**Background:** Grinding and polishing procedures during dental prosthesis and appliance adjustments generate airborne dust particles that pose potential occupational health hazards. Despite the availability of dust control measures, their routine use among dental students remains uncertain, particularly in the Indian context.

**Aim:** To assess the practices of dental students towards dust control during prosthesis and appliance adjustments.

**Materials and Methods:** A cross-sectional descriptive survey was conducted among 200 undergraduate dental students from dental colleges using a structured, self-administered online questionnaire. The questionnaire assessed awareness, practices, and institutional factors related to dust control during prosthetic and appliance adjustments.

**Expected Outcome:** The study is expected to highlight prevailing practices, identify gaps in dust control measures, and provide insights for improving occupational safety training in dental education.

**Keywords:** Dust control, dental students, prosthesis adjustment, occupational hazard, survey

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## INTRODUCTION

Dental procedures involving trimming, grinding, and polishing of prosthetic materials generate fine particulate matter that can remain airborne for extended periods<sup>1</sup>. These particles originate from materials such as acrylic resin, composites, ceramics, and metal alloys and may be inhaled by both operators and patients during routine clinical procedures<sup>2</sup>.

Exposure to dental material dust has been associated with respiratory irritation, allergic reactions, and cytotoxic effects<sup>3</sup>. Despite the availability of preventive devices such as high-volume evacuators, dust-collecting grinding units, and personal protective equipment, their routine use is often neglected in clinical practice<sup>4</sup>.

Undergraduate dental students represent a vulnerable group, as clinical habits formed during training frequently continue into professional practice. Limited Indian literature is available regarding dust-control practices among dental students, particularly in regions with early clinical exposure. Therefore, this study was undertaken to assess current dust-control practices among undergraduate dental students.

## MATERIALS AND METHODOLOGY

### Study Design

A cross-sectional descriptive survey was conducted using a self-administered online questionnaire.

**Study Setting and Population**

The study population comprised undergraduate Bachelor of Dental Surgery (BDS) students, including third year, final year students, and interns enrolled in dental colleges.

**Sample Size and Sampling Technique**

A sample size of 200 participants was calculated using the formula:  $Sample\ size\ (n) = Z^2 \times p \times q / L^2$

Where:

Z = standard normal variate at 95% confidence interval = 1.96

p = proportion = 50%

q = 100 – 50 = 50%

L = margin of error = 10%

Therefore,

$$n = (1.96)^2 \times (50) \times (50) / (10)^2$$

The calculated sample size was approximately 195 and was rounded off to 200 participants. Stratified random sampling was employed based on the academic year to ensure proportional representation.

**Data Collection Tool**

Data were collected using a structured Google Form questionnaire consisting of sections:

- Demographic details (institution and year of study)
- Preferred grinding position during adjustments
- Use of dust control methods for different clinical scenarios
- Self-protection measures adopted
- Particle management practices before and after patient procedures
- Institutional training and availability of dust control equipment

The questionnaire included multiple-choice questions focused on practical behavior rather than theoretical knowledge.

**Data Collection Procedure**

The questionnaire link was circulated electronically among eligible students. Participation was voluntary, and informed consent was obtained prior to accessing the questionnaire. Responses were collected anonymously to ensure confidentiality.

**Data Analysis**

Collected data were entered into a spreadsheet and prepared for statistical analysis. Descriptive statistics were planned to summarize awareness levels and practice patterns.

**RESULTS**

A total of 200 dental students participated in the study. Responses were complete and included in the final analysis.

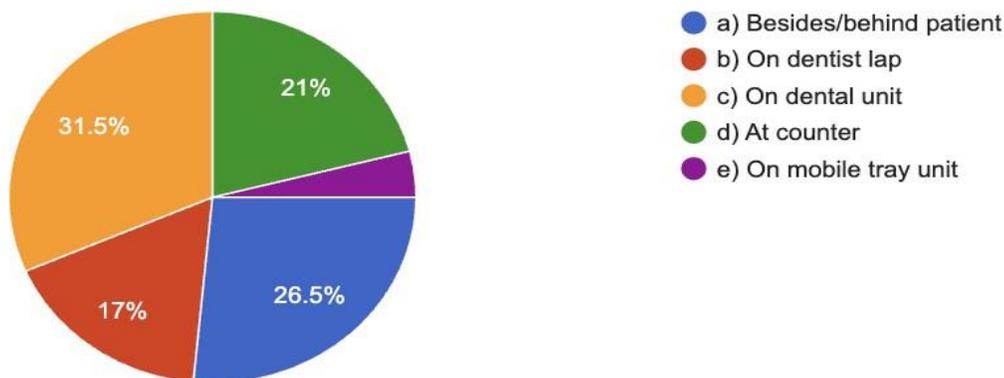
**Participants’ Characteristics (Frequency Distribution)**

**Table 1: Distribution of Participants According to Year of Study (n = 200)**

Year of Study	Frequency (n)	Percentage (%)
Third Year BDS	45	22.5
Final Year BDS	82	41.0
Interns	73	36.5
<b>Total</b>	<b>200</b>	<b>100</b>

Among the respondents, 41% were final-year students, 36.5% were interns, and 22.5% were third-year students. The majority of participants were therefore students with active clinical exposure to prosthesis and appliance adjustments.

**Preferred Grinding Position**



**Figure 1: Preferred grinding position during prosthesis and appliance adjustment**

The most commonly reported grinding position was on the dental unit (31.5%), followed by beside or behind the patient (26.5%). Grinding at the counter was reported by 21% of students, while 17% performed grinding on the dentist’s lap. Only 4% used a mobile tray unit.

This distribution shows that grinding is frequently performed close to the operator and patient, increasing the likelihood of dust exposure.

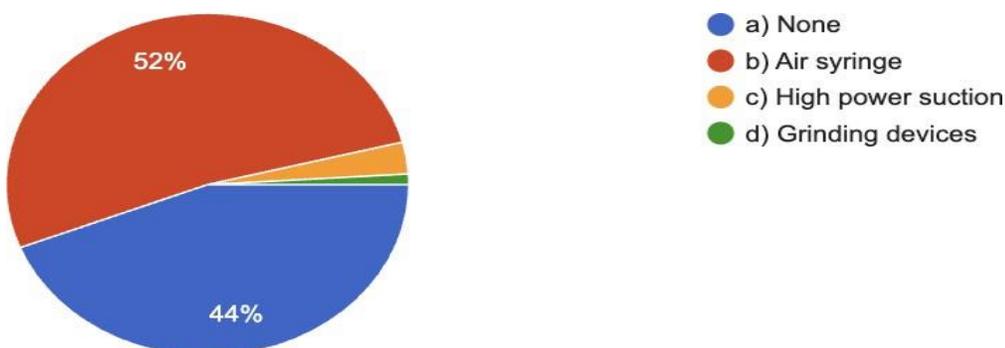
**Lab As-Received Prosthesis**



**Figure 2: Preventive devices used during adjustment of lab as-received prosthesis**

For adjustment of prostheses received from the laboratory, 58.5% of students reported using no preventive method, while 38% used an air syringe. Very few students used high-power suction (2%) or grinding devices with dust-control features (1.5%).

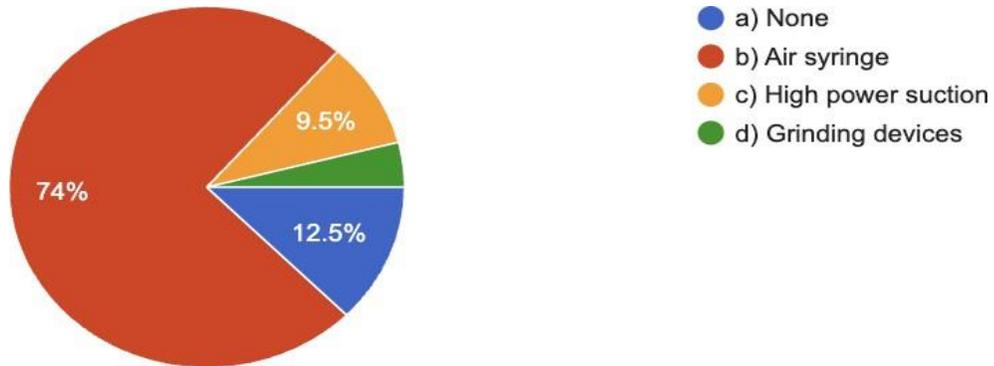
**Previously Worn Prosthesis**



**Figure 3: Preventive devices used during adjustment of previously worn prosthesis**

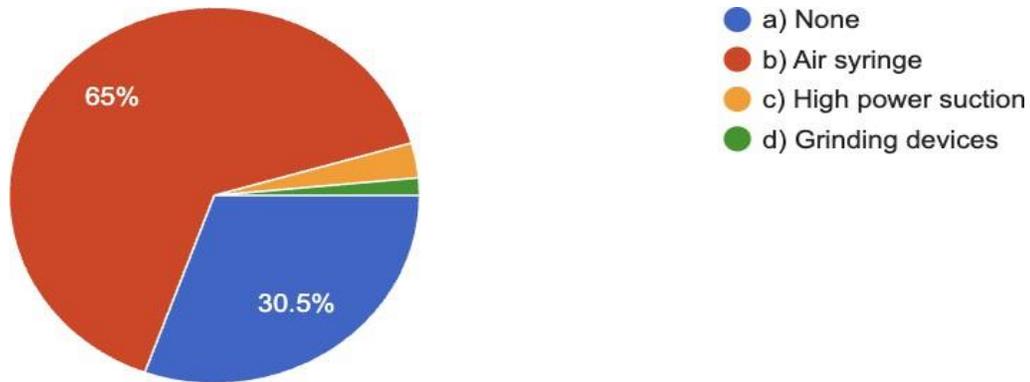
During adjustment of previously worn prostheses, 52% used an air syringe, whereas 44% reported using no preventive method. The use of high-power suction (3%) and grinding devices (1%) remained minimal.

### Acrylic Resin Grinding



**Figure 4: Preventive devices used during grinding of substantial quantity of acrylic resin**

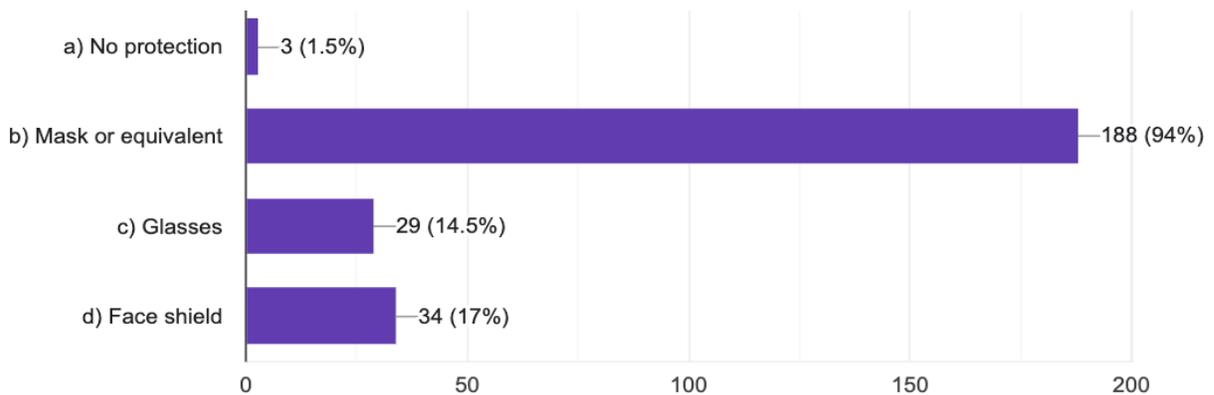
When a substantial quantity of acrylic resin was adjusted, 74% of students used an air syringe, 12.5% used no preventive device, 9.5% used high-power suction, and 4% used grinding devices.



**Figure 5: Preventive devices used during grinding of small quantity of acrylic resin**

For small quantities of acrylic resin, 65% used an air syringe, while 30.5% reported using no preventive method. High-power suction (3%) and grinding devices (1.5%) were rarely used.

### Self-Protection Methods



**Figure 6: Self-protection methods used by participants**

Most respondents (94%) reported using a mask or equivalent protection. Use of face shields (17%) and protective glasses (14.5%) was comparatively lower. A small proportion (1.5%) reported using no personal protective equipment.

### Particle Management Practices

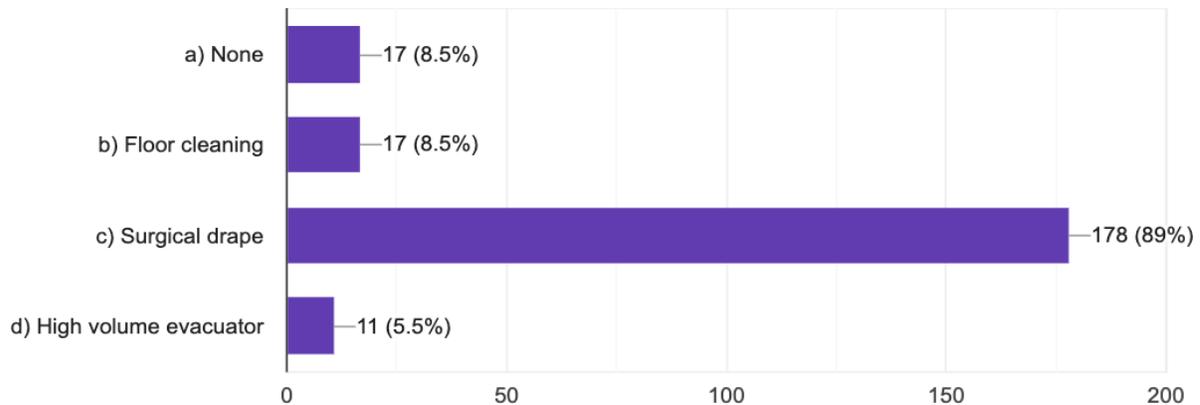


Figure 7: Particle management methods during procedures

Surgical drapes were used by 89% of students for particle management. High-volume evacuators were used by only 5.5%.

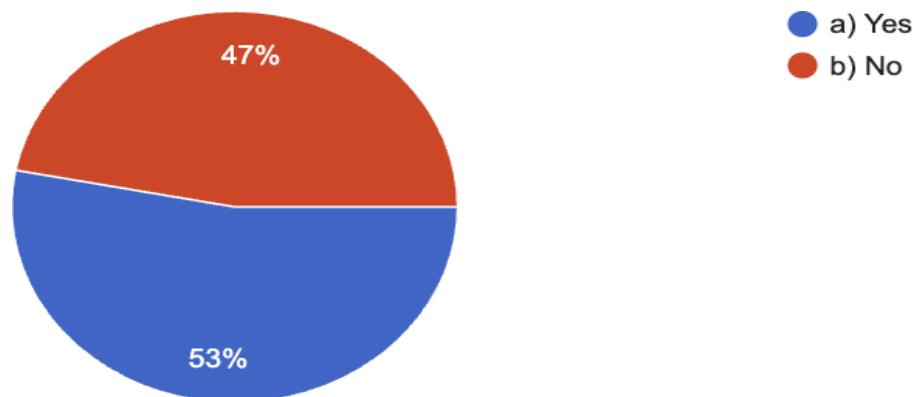


Figure 8: Particle management after each patient

Post-procedure particle management was performed after each patient by 53% of students, while 47% did not perform routine particle management.

## DISCUSSION

The present study assessed dust-control practices among undergraduate dental students during prosthesis and appliance adjustments and revealed several important trends related to occupational safety in dental training. A majority of participants were final-year students and interns, indicating that the findings largely reflect practices followed during active clinical exposure.

Grinding procedures were commonly performed on the dental unit or beside the patient, which places both the operator and patient within close proximity to the source of airborne particles. Such positioning has been shown to increase the spread of fine particulate matter within the operative environment, especially when effective dust-control devices are not used<sup>1,2</sup>. Despite this, a large proportion of students relied on air syringes or no preventive measures during grinding procedures.

Across all clinical scenarios evaluated lab as-received prostheses, previously worn prostheses, and acrylic resin grinding the air syringe was the most frequently used method. While air syringes may assist in clearing debris, they do not provide dust containment and may further disperse particulate matter into the surrounding air<sup>3</sup>. Previous studies have highlighted that air-driven dispersal of acrylic and composite dust can increase operator exposure rather than reduce it<sup>4</sup>.

The limited use of high-volume evacuators and grinding devices with built-in dust-collection systems observed in this study is consistent with earlier reports among dental professionals and students<sup>5,6</sup>. Factors contributing to this trend may include lack of equipment availability, inadequate training, and the perception that such devices interfere with procedural efficiency. Undergraduate curricula often emphasize infection control related to blood and saliva, while airborne material hazards receive comparatively less attention.

Personal protective practices demonstrated high compliance with mask usage, which is encouraging and likely influenced by increased infection-control awareness in recent years. However, the relatively low use of face shields and protective eyewear suggests incomplete protection against airborne particulate exposure. Dental material dust can enter through ocular surfaces and facial skin, making comprehensive personal protection important during grinding procedures<sup>7</sup>.

Particle management practices during procedures were largely limited to the use of surgical drapes, while the use of high-volume evacuators remained low. Although surgical drapes may help contain visible debris, they do not effectively reduce airborne particles<sup>8</sup>. Furthermore, post-procedure particle management was not consistently practiced, with nearly half of the participants reporting no routine particle management after each patient. This may contribute to cumulative environmental contamination within dental clinics.

Overall, the findings indicate a gap between basic awareness of protective measures and the consistent application of effective dust-control strategies. Addressing this gap at the undergraduate level through structured demonstrations, reinforcement during clinical postings, and improved access to dust-control equipment may help promote safer long-term clinical practices<sup>9,10</sup>.

## CONCLUSION

The findings of the present study indicate that dust-control practices among undergraduate dental students are suboptimal, with a predominant reliance on air syringes or absence of preventive measures during prosthesis and appliance adjustments. Although the majority of students reported using masks, the use of effective engineering controls such as high-volume evacuators and dust-collecting grinding devices was limited.

Inadequate particle management during and after clinical procedures further highlights the need for improved emphasis on occupational safety during undergraduate dental training. Incorporating focused teaching modules, hands-on demonstrations, and reinforcement of effective dust-control practices during clinical postings may help reduce exposure to airborne dental material dust.

Strengthening awareness and practical implementation of dust-control measures at the undergraduate level can contribute to safer clinical environments and encourage the development of long-term protective habits among future dental practitioners.

### **Ethical clearance**

The author(s) declare that they have taken the ethical approval from the Institutional Ethical Committee [Ref.No. KVV/IEC/06/2025]

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